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(71) Applicant *(for all designated States except US)*: **CRISPLANT A/S** [DK/DK]; P.O. Pedersens Vej 10, DK-8200 Århus N (DK).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **ABILDGAARD, Anne-Mette, Hjortshøj** [DK/DK]; Knudrisgade 52, DK-8000 Århus C (DK). **CHRISTENSEN, Jan, Gulløv** [DK/DK]; Rindsvej 32, 1. mf., DK-8900 Randers (DK).

(74) Agent: **PLOUGMANN, VINGTOFT & PARTNERS** A/S; Sankt Annæ Plads 11, P.O. Box 3007, DK-1021 Copenhagen K (DK).

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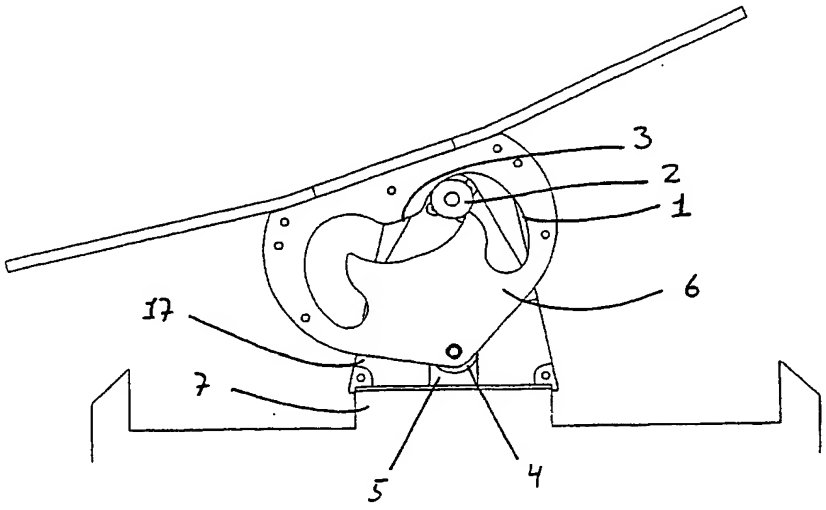
(54) Title: A SORTING CONVEYER WITH A TILTING MECHANISM



(57) Abstract: A tilting mechanism comprising an article-supporting member, such as a tray or a conveyor belt for a sorter for transporting and sorting various articles is disclosed. The article-supporting member may be held tilted about two parallel axes each being fixed with respect to the tilting part or the stationary part and being movable along a predetermined path with respect to the other part. Further is disclosed a sorter comprising article-supporting members arranged on tilting mechanisms to tilt the members when passing curves and during induction of articles from the side of the sorter so as to prevent articles from sliding off the members and thus enable the sorter to operate at much higher conveying speeds than known sorters.

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A SORTING CONVEYER WITH A TILTING MECHANISM

The present invention relates to a tilting mechanism comprising an article-supporting member, such as a tray or a conveyor belt or any other suitable member for a sorter for transporting and sorting various articles. The article-supporting member may be held tilted about two parallel axes each being fixed with respect to the tilting part or the stationary part and being movable along a predetermined path with respect to the other part.

The present invention further relates to a sorter comprising article-supporting members arranged on tilting mechanisms to tilt the members when passing curves and during induction of articles from the side of the sorter so as to prevent articles form sliding off the members and thus enable the sorter to operate at much higher conveying speeds than known sorters.

BACKGROUND

Sorters having tilt mechanisms for tilting trays by rotating the tray about a tilting axis being stationary with respect to a frame part of the tilting mechanism and to the sorter are well-known. Tilting mechanisms divided into two separate mechanisms, normally one mechanism for discharging to each side, in which each mechanism has a tilting axis are also known.

It is further known from EP 0 664 262 A1 to have a tilting mechanism that has a simple movable tilting axis, in this mechanism two axles move in linear paths being a horizontal and a vertical path. The drive means is a rail along the moving path of the tilt-sorter.

US 4,722,430 discloses a mechanism that comprises "a rotatable pinion placed on one of the uprights", the uprights being placed on a frame part and "an arc of a pinion co-operative hoop extending from the plate for engagement with the pinion", the plate here being the tilt tray. There is no disclosure in this document about tilting of the tray to other angles than a full tilt or no tilt.

The stationary tilt axis and the simple movable tilt axis provides no or only limited possibility to design the movement of the article-supporting member tilted by the tilting mechanism in an advantageous way so as to e.g. take advantage of the act of gravity on

performing the tilt. Other objects of the present invention will be understood from the following description.

It is a further object of the present invention to provide a sorter having tilting mechanisms that are controlled to tilt an article-supporting surface of an article-supporting part e.g. a tray or a cross-belt, in a ungraduated way and to control this tilt so as to tilt in any angle within a range at any time, so that the article is kept on the surface or discharged from the surface as desired, e.g. at high speed in horizontal curves, at high speed induction of articles from the side of the sorter and when being discharged from the article-supporting surface at the discharge stations.

Thus, the present invention relates to a tilting mechanism for a sorter comprising

a frame part,

a tilting part for supporting an article-supporting part of the sorter, the article-supporting part having an article-supporting surface,

drive means for tilting the tilting part of the mechanism,

the frame part and the tilting part mutually engaging about at least two points, each of the points being fixed with respect to one of said frame part and said tilting part and being movable along a predetermined path with respect to the other of said two parts,

at least one of the predetermined paths being non-linear.

The frame part and the tilting part engage in a preferred embodiment of the invention mutually about at least two axes being substantially parallel, each of the axes being fixed with respect to one of said frame part and said tilting part and being movable along a predetermined path with respect to the other of said two parts,

the frame part and the tilting part each defining a main direction, the main direction of the frame part being defined by a vector having the frame part as its initial system and the main direction of the tilting part being defined by a vector having the tilting part as its initial system, the vectors being coincident in an article-carrying non-tilted position of the tilting part in which position the vectors are projections of a vertical vector on a plane perpendicular to the axes, both the vectors pointing in a direction away from the frame part,

the predetermined paths being designed so that both axes during the course of a tilting operation are moved with a component in the main direction of the part with respect to which the respective axis moves.

longest distance from the discharge station are caused to move faster and the articles that have the shortest distance to travel to move slower towards the discharge station during a discharge operation.

The centre of gravity of the tilting part including the article-supporting part and optionally an article supported thereon is advantageously moved in a direction having a component in the negative main direction of the frame part during a main part of the course of a tilting operation.

Alternatively or additionally, the centre of gravity of the tilting part including the article-supporting part and optionally an article supported thereon may be moved in a direction having a component in the positive main direction of the frame part during an end part of the course of a tilting operation.

If the centre of gravity is to be lifted during a tilt operation, the drive have to be dimensioned to be able to lift the maximum article weight plus the mass of the tilting part, but if the centre of gravity is only lowered during the tilt, driving means of less output effect can be used.

It is known that if the drive means have to act as brakes for the tilting mechanism, this will cause wear of the drive means. This problem will mainly be present where the drive means have to brake the tilting mechanism as well as the articles, such as at the end of a down tilt. The present invention makes it possible to have the tilting part raised at the end of the tilt and thereby brake the tilt by means of the gravity, which will cause the drive means to be used less as a brake.

It is preferred that control means, preferably control means of the individual tilting mechanism, is adapted to tilt the tilting part in order to prevent an optional article from sliding off the article-supporting surface when being subjected to a centrifugal force or other transversal forces, e.g. to tilt in a predetermined angle to prevent an optional article from sliding off the article-supporting surface when being subjected to a centrifugal force or other transversal forces.

In a further embodiment of the invention control means is adapted to tilt the tilting part in order to prevent the article from sliding off the article-supporting surface when the article

or the same as the radius of the wheel. The driving means may comprise a drive wheel with an axis coinciding with the second axis and arranged on the part on which the second axis is fixed, the drive wheel engaging the part on which the second axis is movable so as to drive the tilting part of the mechanism.

In an embodiment of the invention the drive wheel is a toothed wheel and the part with which the drive wheel engages is equipped with a toothed rim engaging with the drive wheel. As one alternative, the drive wheel may be a friction wheel and the part with which the drive wheel engages may be equipped with a friction surface engaging with the drive wheel. In a second alternative, the drive wheel is a notched wheel and the part with which the drive wheel engages is equipped with a notched surface engaging with the drive wheel. Preferably, the path of the first axis is a linear path being substantially parallel to the main direction of one of the tilting part and the frame part.

It is advantageous that the non-linear path of the tilting mechanism is shaped to make the tilting operation perform the tilt so that

the tilting part in a non-tilted position is kept stable by a shape of the path that makes it necessary for the driving means to lift the tilting part against the direction of gravity, the article-supporting part and an optional article in a first part of the tilt,

the centre of gravity of the tilting part, the article-supporting part and the optional article is moved in a direction having a negative component in the main direction of the frame part, in a second part of the tilt, the second part of the tilt being substantially a main part of the tilt, and

the centre of gravity of the tilting part, the article-supporting part and the optional article is moved in a direction having a positive component in the main direction of the frame part in a last part of the tilt.

In an embodiment of the invention the tilting part comprises a second tilting part for tilting the article-supporting part of the mechanism about an axis being substantially perpendicular to the axes as well as to the main direction of the frame part.

This will make it possible to tilt the article-supporting surface in a direction so that when the tilting mechanism passes vertical curved of the track, the article-supporting surface can be maintained in a substantially horizontal position. Control means may preferably be adapted to tilt the second tilting part in order to prevent an optional article from sliding off

a pneumatic pump driven by an electrical motor, for which the power may be supplied through a pair of collector shoes. Alternatively, the power for the electrical motor may supplied through inductive power transfer means or by means of an electrical generator driven by a wheel engaging with a stationary part of the sorter.

The article-supporting part of the tilting mechanism may comprise an endless belt defining an article-supporting surface and drive means for driving the belt in a direction substantially perpendicular to a conveying direction of the sorter. In preferred embodiments of the invention, however, the article-supporting part comprises a tray having an article-supporting surface.

According to a further alternative embodiment, the article-supporting part comprises rollers that may rotate freely around axes that are substantially parallel to the conveying direction of the sorter.

This embodiment may also have a braking system to brake the rollers, so that when an article is supported by the rollers these are braked to prevent the article from rolling/sliding off the article-supporting surface and the roller are unbraked as the article is loaded onto and discharged from the article-supporting surface to ease the sliding of the articles. This embodiment is in particular preferred when the articles have a surface that has a high friction coefficient.

According to another embodiment of the invention, the tray along a substantial part of its longitudinal mid-axis comprises a ridge extending parallel to the two parallel axes and extending upwardly from the article-supporting surface of the tray so as to prevent articles from sliding past the ridge at any tilt position of the tray.

This ridge will when the tray is tilted prevent articles on the opposite side as the discharge station from being discharged thus making it possible to have two articles on one tray and discharge said articles at separate discharge stations.
The mechanism may in a preferred embodiment comprise a position means for determining at least whether the tilting part is in a predetermined tilt position, such as whether the tilting part is in its article carrying position or in a max tilt position. It is further preferred to have a device or position means that indicates the position of the tilt, such as

In a preferred embodiment the tilting part is positioning the article-supporting surface so that the main direction of the tilting part and the direction of the resultant force are substantially parallel as long as the mechanism is in an article-supporting mode.

One particularly embodiment of a tilting mechanism for a sorter according to the invention comprises

a frame part,

a tilting part comprising a tray for supporting of articles,

the tilting part being tilted by means of an electrical motor to which power is supplied by means of a pair of collectors shoes and a conductor rail on a stationary part of the sorter,

the frame part and the tilting part mutually engaging about at two axes being substantially parallel, one of said axes being fixed to said tilting part and the other of said axes being fixed to said frame part,

the axis that is fixed to the tilting part is placed substantially lower than the axis that is fixed to the frame part when the tilting part is in a non-tilted position,

a steering wheel having an axis coinciding with the axis that is fixed to the tilting part is mounted on the tilting part, the axis being movable in a main direction of the frame part as defined previously, the steering wheel moves in a slot formed in the frame part,

an axle placed on the axis that is fixed to the frame part having a smooth wheel to support the weight of the tilting part and articles supported thereon, a drive wheel to induce the tilting movement as well as a gear and the electrical motor,

the drive wheel is engaging a non-linear pinion part and the smooth wheel engaging a similar and parallel smooth part, said pinion part and said smooth part forming parts of the frame part,

this complete configuration is duplicated in each end of the tray.

The present invention furthermore relates to a sorter running on a track, the sorter comprising a plurality of article-supporting parts placed on tilting mechanisms, the tilting mechanisms being able to tilt the article-supporting parts in a direction substantially perpendicular to the conveying direction of the sorter and being capable of tilting the article-supporting parts inwardly when the article-supporting parts, during operation of the sorter, pass curves so that the influence of centrifugal forces caused by the curve passage at the transport speed of the sorter is counteracted.

The inward tilting of the tilting mechanism of the sorter according to the present invention is preferably controlled in response to a control means sensing the centrifugal force to which an article supported on an article-supporting means is subjected.

The tilting mechanism of the sorter according to the present invention is preferably and advantageously a tilting mechanism according to the present invention as described previously.

In one embodiment of the invention the article-supporting parts are trays but also embodiments where the article-supporting parts are endless belts or comprise rollers are possible according to the present invention.

In an alternative embodiment of the invention a combination of article-supporting parts is provided, e.g. at least one tilting mechanism comprising a tray having an article-supporting surface and at least one tilting mechanism comprising an endless belt defining an article-supporting surface and drive means for driving the belt in a direction substantially perpendicular to the conveying direction of the sorter. In other embodiments the combination comprises other combinations of article-supporting parts.

In an embodiment of the invention the each tilting mechanism has a unique number. The unique number is used for identification either for a control unit such as a central computer device or to communicate the identity to an induction station device, a discharge station or other devices of the sorter.

In a preferred embodiment of the invention the unique number of the tilting mechanism is provided in a machine readable form on the surface of the mechanism. Hereby the identification of the mechanism and thus the optional article on the article-supporting part of the mechanism, is possible by a machine reading device arranged along the track. The identification is in an embodiment used to determine whether the optional article should be discharged or otherwise processed or alternatively whether an article should be inducted onto an empty article-supporting surface.

Furthermore, the identification may be used for detection of the position of the mechanism and in general the optional article on the mechanism.

In a preferred embodiment of the sorter the tracks are inclined in the horizontal curves to tilt the mechanisms for preventing the articles from sliding of the article-supporting surface. This tilt of the curves is advantageous to provide a tilting of the article-supporting surface without tilting the article-supporting part according to the track, alternatively minimises or decrease the tilting of the article-supporting part according to the track. In an embodiment of the invention the tilting of the article-supporting surface in the curves is a combination of a tilted track and the tilting of the mechanism. In a power off situation or a stop situation the mechanism is adjusting the article-supporting surface so that it is horizontal and thus counteracts the tilting of the track.

It is facilitated that the conveying speed of the sorter necessitates the inward tilting to prevent articles carried by the article-supporting means from sliding off the article-supporting means during passage of horizontal curves. The conveying speed may be at least 2 m per second or even of at least 3 m per second. Preferably, the sorter moves at a speed in the range of 3-8 m per second, such as in the range of 3-6 m per second, for example 3-5 m per second.

In a preferred embodiment the track part defines, when projected on a horizontal plane, a closed loop.

The present invention relates according to a separate aspect of the present invention, which aspect may be regarded as an invention in itself, to a sorter comprising

a stationary track,

movable conveyor means arranged for moving along the track,

conveyor drive means for driving the conveyor means along the track,

a plurality of tilting mechanisms arranged on the conveyor means, each comprising

a frame part being stationary with respect to the conveyor means,

a tilting part for supporting an article-supporting part of the sorter, the article-supporting part having an article-supporting surface,

tilt drive means for tilting the tilting part of the mechanism in a direction substantially perpendicular to the direction of movement of the sorter,

at least one induction station for loading articles onto the article-supporting surfaces, and

In addition, the control units may be adapted to move the tilting parts to an inclined position of the article-supporting surfaces when passing said curves only on the condition that an article is present on the article-supporting surface so as to avoid unnecessary wear of the tilting mechanism. For this purpose, the control unit may be given the knowledge of whether an article is present e.g. at the induction station and the discharge station(s) but according to an alternative embodiment, at least one detection device is arranged along the stationary track, the detection device comprising article detection means for detecting the presence of articles on the article-supporting surfaces and signal means for providing an output accordingly to communication means of the respective control units. The communication means are preferably adapted for wireless communication and said signal means comprises an emitter for providing the output as a wireless signal to said communication means. In particular, said emitter may be an infra red light source.

In order to enable the sorter to run a different speeds, it is advantageous that the inclination of the article-supporting surfaces in said inclined position is variable and its actual magnitude is determined by the control units from the conveying speed of the conveyor means and/or from the weight of the article and/or the geometry of the article or other physical characteristics of the article. Furthermore, the speed with which the tilt drive means moves the tilting part to discharge articles at the at least one discharge station may also be variable and is determined by the control unit from the conveying speed of the conveyor means. It is in this respect also advantageous that in case the at least one induction station loads articles onto the article-supporting surfaces with a velocity component of the article in a direction perpendicularly to the direction of movement of the conveyor means, the control units is adapted to move the tilting parts to an inclined position of the article-supporting surfaces when articles are loaded onto the article-supporting surfaces so as to prevent the articles from sliding off the article-supporting surface in the direction of said velocity component. The induction station is typically arranged as a belt conveyor next to the conveyor means with an angle between the conveying directions of about 30 degrees. The articles to be loaded onto the article-supporting surfaces are accelerated so that they have a velocity component in the conveying direction of the conveyor means of a magnitude substantially equal to the conveying speed of the conveyor means. Thereby, a velocity component in the direction perpendicular to the conveying direction of the conveyor means is created, and

respective article-supporting parts to an edge in the transversal direction of the articles-supporting surfaces.

Such a movement of the articles could be performed by shaking the mechanism in a predetermined pattern making fast tilts from side to side.

The control of the tilting mechanisms and the discharge mechanisms of the above-described sorters may also include control for induction of articles onto the article-supporting surfaces and discharge of articles from the surfaces during passage of horizontal curves of the track.

The sorters may comprise carriages coupled together on which one or more tilting mechanisms each having an article-supporting member is arranged. Two or more mechanisms on the same carriage is advantageous if articles are to be supported by more than one article-supporting member because the members supported on the same carriage does not have mutual movements during passage of horizontal or vertical curves of the track. Also, the carriages of the sorter does not necessarily all have the same length in the conveying direction of the sorter or have the same number of mechanisms arranged.

The sorters may be so-called line sorters or slat sorters in which the individual article-supporting surfaces are formed as slats extending transversally to the conveying direction of the sorter and the articles are supported by a plurality of such slats that may be tilted individually.

The sorters may alternatively have the track part arranged so that the carriages are supported at one side instead of as usually from below. Such sorters may have an over-under configuration in which discharge stations may be arranged stacked in the vertical direction, the track part comprises vertical end turns which shift the conveying direction of the carriages and the vertical level in which they moves, and the sorter comprises means for maintaining the horizontal position of the article-supporting surfaces during passage of the end turns.

The smooth wheel 4 that runs in the linear path 5 is placed on the tilting part 6, as well as the tray, and the linear path 5 is placed on the frame part 7, if this figure was made from the opposite side of the mechanism it would have the exact same appearance.

The non-linear path 1 and the linear path 5 are formed as slots or grooves in the tilting part 6 and the motor and gear housing 17 of the frame part 7, respectively.

The non-linear path 1 is here shaped so that when the drive wheel 15 is in a predetermined position on the non-linear path 1, any rotation movement of said drive wheel will cause the centre of gravity of the tilting part 6 to move in an upwards direction. This will cause the movement of the tilting part 6 to be braked as kinetic energy is transformed into potential energy when the tilting part 6 is moving from a generally non-tilted position as in Fig. 1 to a full tilted position as in Fig. 5.

In this way the tilting of the tilting part 6 is helped by gravity in the first part of the tilt and the braking or stopping of the tilt is helped by gravity in the last part of the tilt.

Also the non-linear path 1 could be shaped so that when the drive wheel 15 is in a predetermined position, any rotating movement of the drive wheel 15 will cause the tilting part 6 to rotate in the same direction towards being in a non-tilted position. This shape of the non-linear path 1 will cause the time of discharge of the articles to be equalised.

Fig. 2 is the same view as Fig. 1, but here the tilting part 6 is slightly tilted compared with the position in Fig. 1. The smooth wheel 4 is now at a lower position than in the non-tilted position in Fig. 1.

Fig. 3 is again the same view as in Figs. 1 and 2 in which the tilting part 6 is in a position characterised in that the smooth wheel 4 now is at its minimum height.

Fig. 4 is yet again the same view as Figs. 1-3. In Fig. 4 the smooth wheel 4 is on its way upward again.

Fig. 5 is still the same view as Figs. 1-4. In Fig. 5 the tilting has come to the outer extreme position in which the tray is fully tilted so as to discharge an article supported thereon, the

Figs. 11 and 12 show the same view of the mechanism as Figs. 8 and 9, only on these figures the motor and gear housing 17 are placed directly on the trolley frame 21 and the tray 22 is placed directly on the tilting part 6.

Fig. 13 shows the same view of the mechanism as Fig. 10, only on this figure the motor and gear housing 17 is placed directly on the trolley frame 21 and the tray 22 is placed directly on the tilting part 6.

Figs. 14-16 illustrate the position of the main direction vectors of the tilting part 6 and the frame part 7. The tilting part 6 main direction 23 having the tilting part 6 as its initial system, and the frame part 7 main direction 24 having the frame part 7 as its initial system.

Figs. 17-21 illustrate an end view of a second embodiment of the mechanism according to the present invention. In these figures parts are removed to make it possible to see the non-linear path 1 in which a smooth wheel 2 runs, the mechanism being shown in a non-tilted position and the smooth wheel 2 is resting on a part 3 of the path 1 that has the same diameter as the wheel 2.

The smooth wheel 4 that runs in the linear path 5 is placed on the tilting part 6, as well as the tray, and the linear path 5 is placed on the frame part 7, and if this figure was seen from the opposite side of the mechanism, it would have the exact same appearance.

The non-linear path 1 and the linear path 5 are formed as slots or grooves in the tilting part 6 and the motor and gear housing 17 of the frame part 7, respectively.

The non-linear path is shaped so that when the tilting part is in a maximum tilt position any tilting movement, increasing or decreasing the tilting angle, will cause the centre of gravity of the tilting part including the article-supporting part and optionally an article supported by the article-supporting part to move in a direction having a positive component in the main direction of the frame part. The figures show the tilting mechanism in different tilting angles starting with Fig. 17 showing the mechanism in a non-tilted position and the following figures show the mechanism in 10°, 20° and 30° and Fig. 21 in 45° respectively.

CLAIMS

1. A tilting mechanism for a sorter comprising

a frame part,

a tilting part for supporting an article-supporting part of the sorter, the article-supporting part having an article-supporting surface, and

drive means for tilting the tilting part of the mechanism,

the frame part and the tilting part mutually engaging about at least two points, each of the points being fixed with respect to one of said frame part and said tilting part and being movable along a predetermined path with respect to the other of said two parts,

at least one of the predetermined paths being non-linear.

2. A tilting mechanism according to claim 1, wherein the mechanism further comprises a drive wheel, and the frame part and the tilting part mutually engage about at least two axes being substantially parallel, each of the axes being fixed with respect to one of said frame part and said tilting part and being movable along a predetermined path with respect to the other of said two parts,

the frame part and the tilting part each defining a main direction, the main direction of the frame part being defined by a vector having the frame part as its initial system and the main direction of the tilting part being defined by a vector having the tilting part as its initial system, the vectors being coincident in an article-carrying non-tilted position of the tilting part in which position the vectors are projections of a vertical vector on a plane perpendicular to the axes, both the vectors pointing in a direction away from the frame part,

the predetermined paths being designed so that both axes during the course of a tilting operation are moved with a component in the main direction of the part with respect to which the respective axis moves.

3. A tilting mechanism according to claim 2, wherein, during the course of a tilting operation, at least one of the axes is moved in a direction having a component in the main direction as well as in a direction having a component in the opposite direction of the main direction of the part relatively to which said axis moves.

4. A tilting mechanism according to claim 2 or 3, wherein the drive wheel is driving on the non-linear path, and the non-linear path is shaped so that when the tilting part is in a

so as to decrease the angle between the velocity of the article when being loaded onto the article-supporting surface and the main direction of the tilting part.

11. A tilting mechanism according to any of the claims 2-10, wherein the tilting part may be tilted to any degree of tilt ungraduated between a non-tilted position and an extreme position.

12. A tilting mechanism according to any of the claims 2-11, wherein the axes are directed non-parallel to a direction of movement of the sorter.

13. A tilting mechanism according to any of the claims 2-12, wherein a first axis is movable along a predetermined, linear path and a second axis is movable along another predetermined, non-linear path.

14. A tilting mechanism according claim 13, wherein a substantial part of the weight of the article-supporting part and an optional article thereon in a non-tilted position is carried by at least one support wheel with an axis coinciding with the second axis and arranged on the part on which the second axis is fixed, the support wheel being supported on a curved surface of the part on which the second axis is movable, said surface has, at the point of engagement with said wheel, a radius of curvature larger than or the same as the radius of the wheel.

15. A tilting mechanism according to claim 13 or 14, wherein the driving means comprises a drive wheel with an axis coinciding with the second axis and arranged on the part on which the second axis is fixed, the drive wheel engaging the part on which the second axis is movable so as to drive the tilting part of the mechanism.

16. A tilting mechanism according to claim 15, wherein the drive wheel is a toothed wheel and the part with which the drive wheel engages is equipped with a toothed rim engaging with the drive wheel.

17. A tilting mechanism according to claim 15, wherein the drive wheel is a friction wheel and the part with which the drive wheel engages is equipped with a friction surface engaging with the drive wheel.

24. A tilting mechanism according to claim 23, wherein control means is adapted to rotate the rotation part.

25. A tilting mechanism according to any of the preceding claims, wherein the drive means comprises an electrical motor.

26. A tilting mechanism according to claim 25, wherein the power for the electrical motor is supplied via a pair of collector shoes.

27. A tilting mechanism according to claim 25, wherein the power for the electrical motor is supplied via inductive power transfer means.

28. A tilting mechanism according to claim 25, wherein the power for the electrical motor is provided from the motion of the sorter by means of an electrical generator driven by a wheel engaging with a stationary part of the sorter.

29. A tilting mechanism according to any of the preceding claims, wherein the drive means comprises a hydraulic motor.

30. A tilting mechanism according to claim 29, wherein the power for the hydraulic motor is provided from the motion of the sorter by means of a hydraulic generator driven by a wheel engaging with a stationary part of the sorter.

31. A tilting mechanism according to any of the preceding claims, wherein the drive means comprises a pneumatic motor.

32. A tilting mechanism according to claim 31, wherein the power for the pneumatic motor is provided from the motion of the sorter by means of a pneumatic generator driven by a wheel engaging with a stationary part of the sorter.

33. A tilting mechanism according to any of the preceding claims, wherein the article-supporting part comprises an endless belt defining an article-supporting surface and drive means for driving the belt in a direction substantially perpendicular to a conveying direction of the sorter.

the tilting part being tilted by means of an electrical motor to which power is supplied by means of a pair of collector-shoes and a conductor rail on a stationary part of the sorter,

the frame part and the tilting part mutually engaging about at two axes being substantially parallel, one of said axes being fixed to said tilting part and the other of said axes being fixed to said frame part,

the axis that is fixed to the tilting part is placed substantially lower than the axis that is fixed to the frame part, when the tilting part is in a non-tilted position,

a steering wheel having an axis coinciding with the axis that is fixed to the tilting part is mounted on the tilting part, the axis being movable in a main direction of the frame part as defined in claim 2, the steering wheel moves in a slot formed in the frame part,

an axle placed on the axis that is fixed to the frame part having a smooth wheel to support the weight of the tilting part and articles supported thereon, a drive wheel to induce the tilting movement as well as a gear and the electrical motor,

the drive wheel is engaging a non-linear pinion part and the smooth wheel engaging a similar and parallel smooth part, said pinion part and said smooth part forming parts of the frame part,

this complete configuration is duplicated in each end of the tray.

43. A sorter running on a track part, the sorter comprising a plurality of article-supporting parts placed on tilting mechanisms, the tilting mechanisms being able to tilt the article-supporting parts in a direction substantially perpendicular to the conveying direction of the sorter and being capable of tilting the article-supporting parts inwardly when the article-supporting parts, during operation of the sorter, pass curves so that the influence of centrifugal forces caused by the curve passage at the transport speed of the sorter is counteracted.

44. A sorter according to claim 43, wherein the sorter comprises at least one train each having at least two tilting mechanisms.

45. A sorter according to claim 44, wherein each of the at least one train comprises a braking mechanism for preventing movement between the mechanism and the track part in the conveying direction of the sorter.

55. A sorter according to any of claims 43-54, wherein a plurality of the mechanisms each comprises a logical unit.

56. A sorter according to claim 55, wherein each tilting mechanism of the sorter comprises a logical unit.

57. A sorter according to claim 55 or 56, wherein information to and from the logical units are transmitted by means of a radio transmission device.

58. A sorter according to any of claims 55-57, wherein information to and from the logical units are transmitted by means of an infra red transmission device.

59. A sorter according to any of claims 55-58, wherein information to and from the logical units are transmitted by means of a signal device transmitting through a power transfer system.

60. A sorter according to any of claims 55-59, wherein the logical unit is adapted to perform a self diagnostic of the mechanism.

61. A sorter according to any of claims 56-60, wherein each of the tilting mechanisms comprises a device for determining the position of the mechanism and providing an output accordingly to the logical unit.

62. A sorter according to any of claims 56-61, wherein each of the tilting mechanisms have propulsion means for driving the sorter along the track.

63. A sorter according to any of claims 43-62, wherein the track part is inclined in the horizontal curves to tilt the mechanisms for preventing the articles from sliding of the article-supporting surface.

64. A sorter according to any of the claims 43-63, wherein the conveying speed of the sorter necessitates the inward tilting to prevent articles carried by the article-supporting means from sliding off the article-supporting means during passage of horizontal curves.

movement of the conveyor means, the control units further being adapted to move said article-supporting parts to a substantially horizontal position of the article-supporting surface when passing straight sections of the track.

70. A sorter according to claim 69, wherein the tilting mechanism comprises a force measurement device for determining the direction of the resultant force on the tilting part and providing an output accordingly to the respective control unit which is adapted to control said movements of the tilting parts in accordance with said output.

71. A sorter according to claim 70, wherein the inclination of the article-supporting surfaces in said inclined position is variable and its actual magnitude is determined by the control units from said output.

72. A sorter according to claim 69, wherein the control units each comprises data communication means and the sorter comprises a plurality of signal devices being arranged along the stationary track and each being associated with a curve in the horizontal plane of the track, said data communication means being adapted for detecting a signal device and induce the control unit to initiate inclination of the article-supporting surface accordingly.

73. A sorter according to claim 72, wherein said communication means are adapted for wireless communication and said signal devices each comprises an emitter for providing a wireless signal to said communication means.

74. A sorter according to claim 73, wherein said emitter is an infra red light source.

75. A sorter according to any of claims 72-74, wherein said signal device provides an indication to said communication means of the direction of turn of the curve associated therewith.

76. A sorter according to any of claims 69-75, wherein the control units are adapted to move the tilting parts to an inclined position of the article-supporting surfaces when passing said curves only on the condition that an article is present on the article-supporting surface.

providing an output indicative of the conveying speed of the conveyor means to communication means of the respective control units.

85. A sorter according to claim 84, wherein said communication means are adapted for wireless communication and said speed indication means comprises an emitter for providing the output as a wireless signal to said communication means.

86. A sorter according to claim 85, wherein said emitter is an infra red light source.

87. A sorter according to any of claims 69-86, wherein the conveying speed of the sorter is at least 2 m per second.

88. A sorter according to claim 87, wherein the conveying speed of the sorter is at least 3 m per second.

89. A sorter according to claim 88, wherein the conveying speed of the sorter is within the range of 3-8 m per second, such as in the range of 3-6 m per second, for example 3-5 m per second.

90. A sorter according to any of the claims 69-89, wherein the tilting mechanism is a tilting mechanism according to any of claims 1-41.

91. A sorter according to any of claims 69-86, wherein the control units are adapted to control the speed of the tilting movement during discharge of an article according to a predetermined discharge profile.

92. A sorter according to claim 91, wherein the discharge profile is determined from the weight of the article.

93. A sorter according to claim 91 or 92, wherein the discharge profile is determined from the conveying speed of the sorter.

94. A sorter according to any of claims 91-93, wherein the discharge profile is determined depending on whether the article-supporting part supports the article solely or from its position among two or more adjacent article-supporting parts supporting the same article.

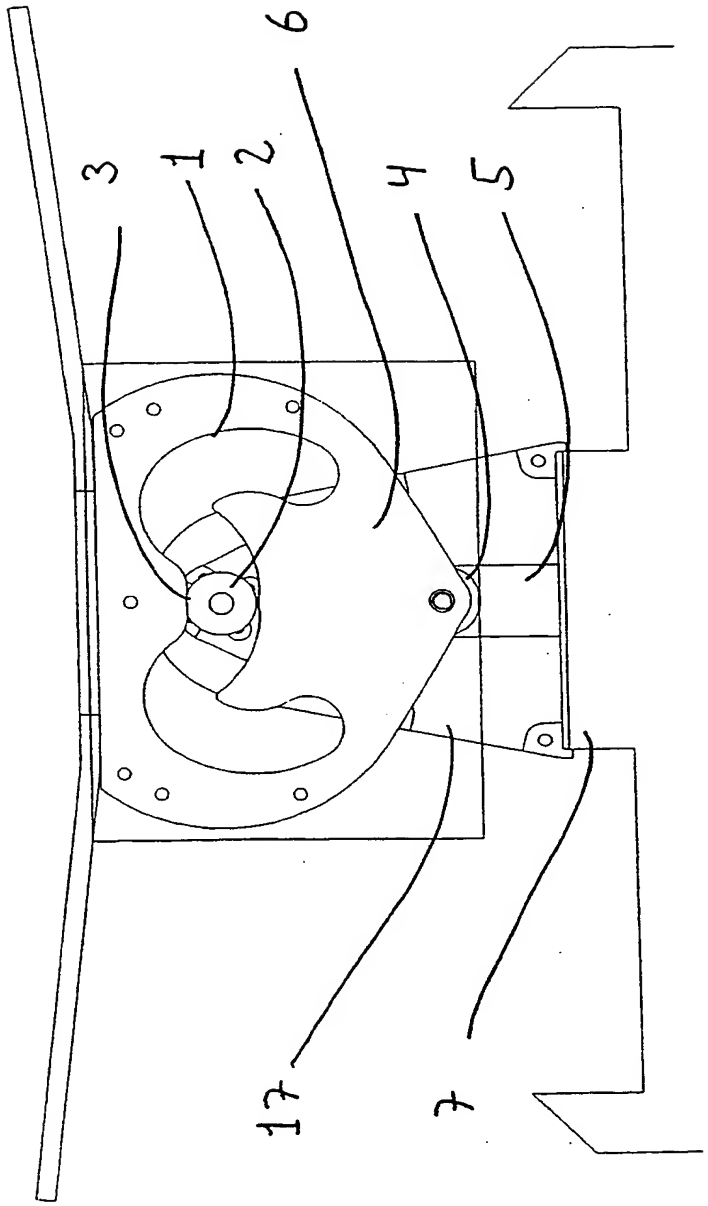

Fig. 1

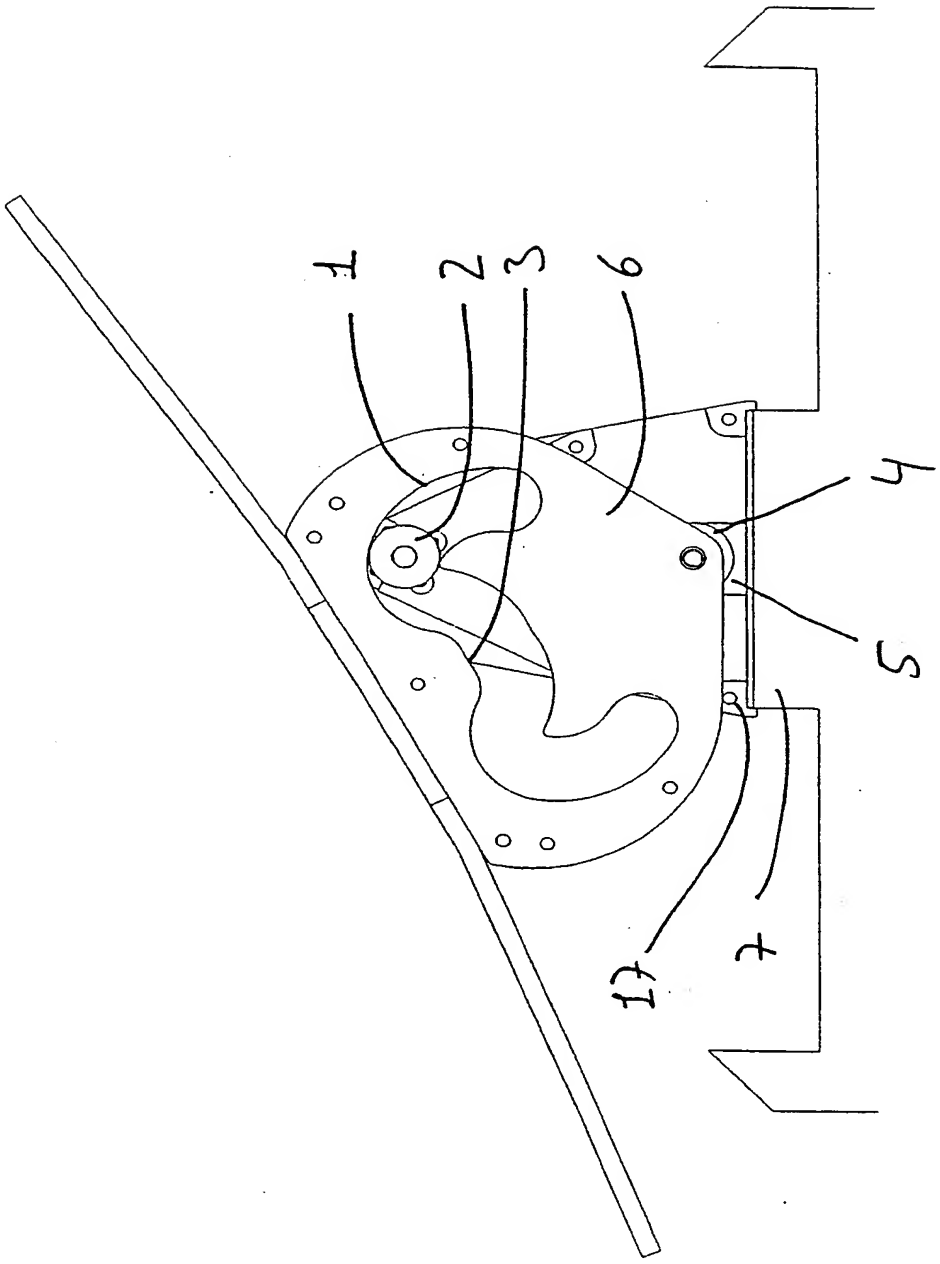

Fig. 3

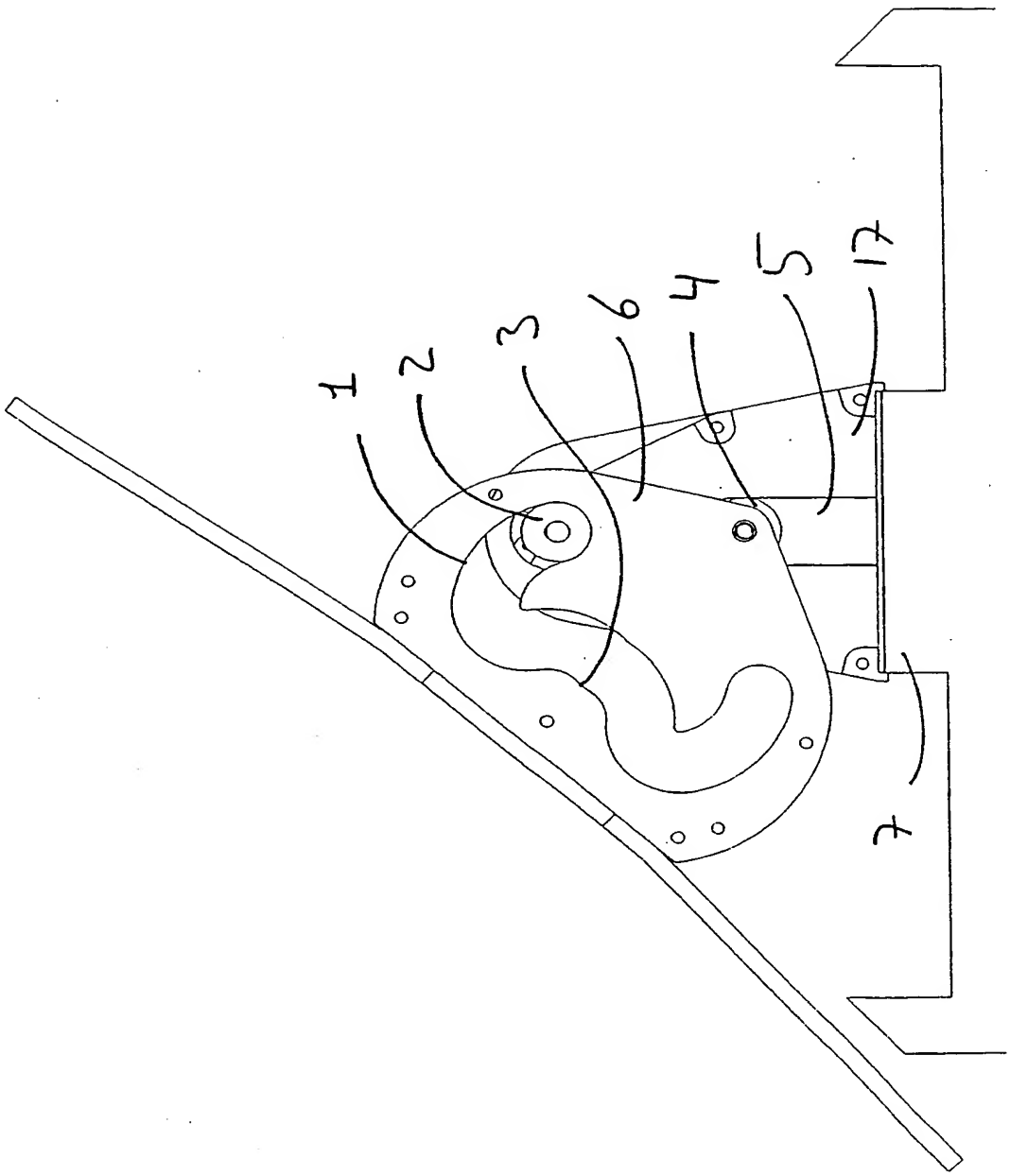

Fig. 5

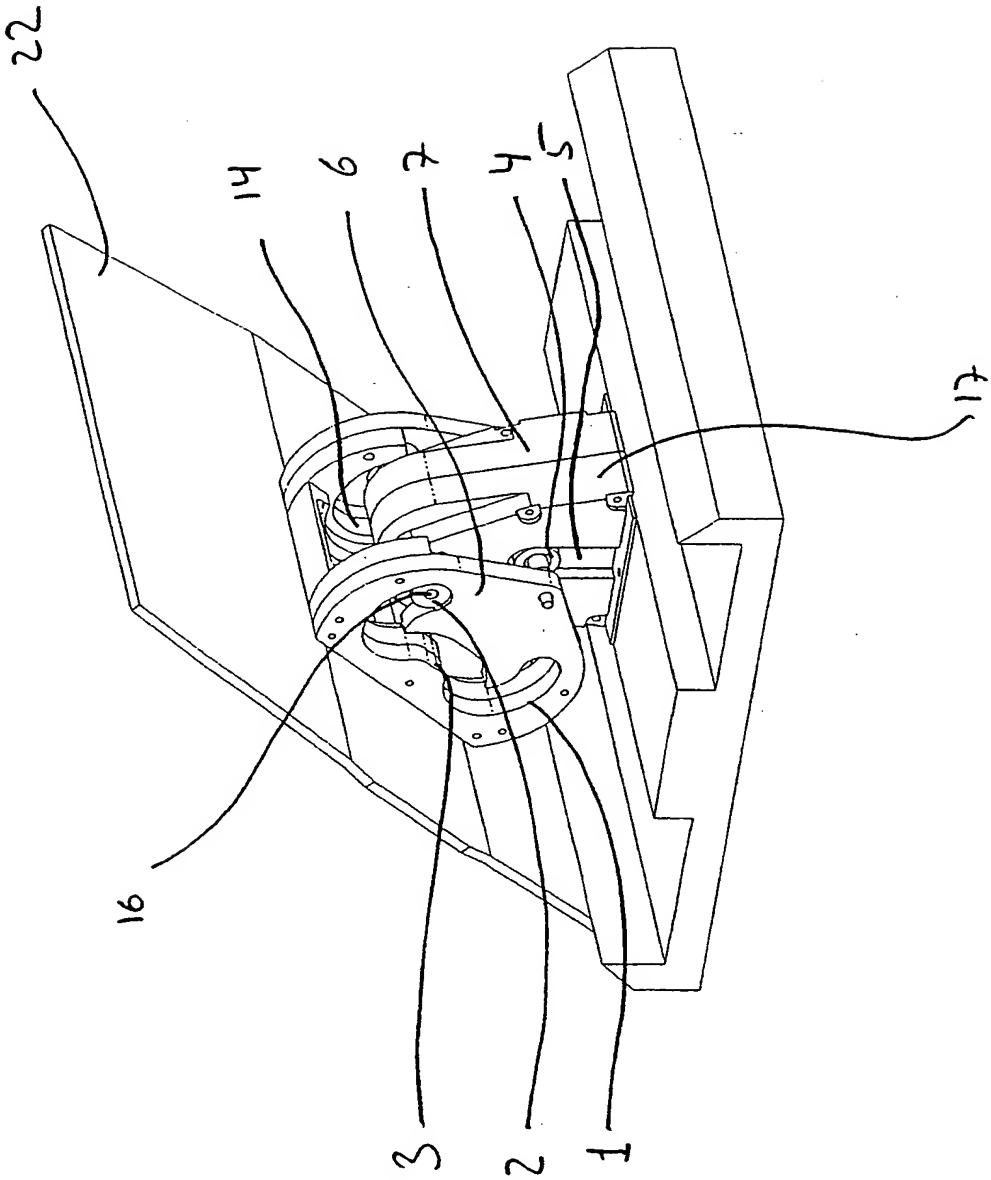

Fig. 7

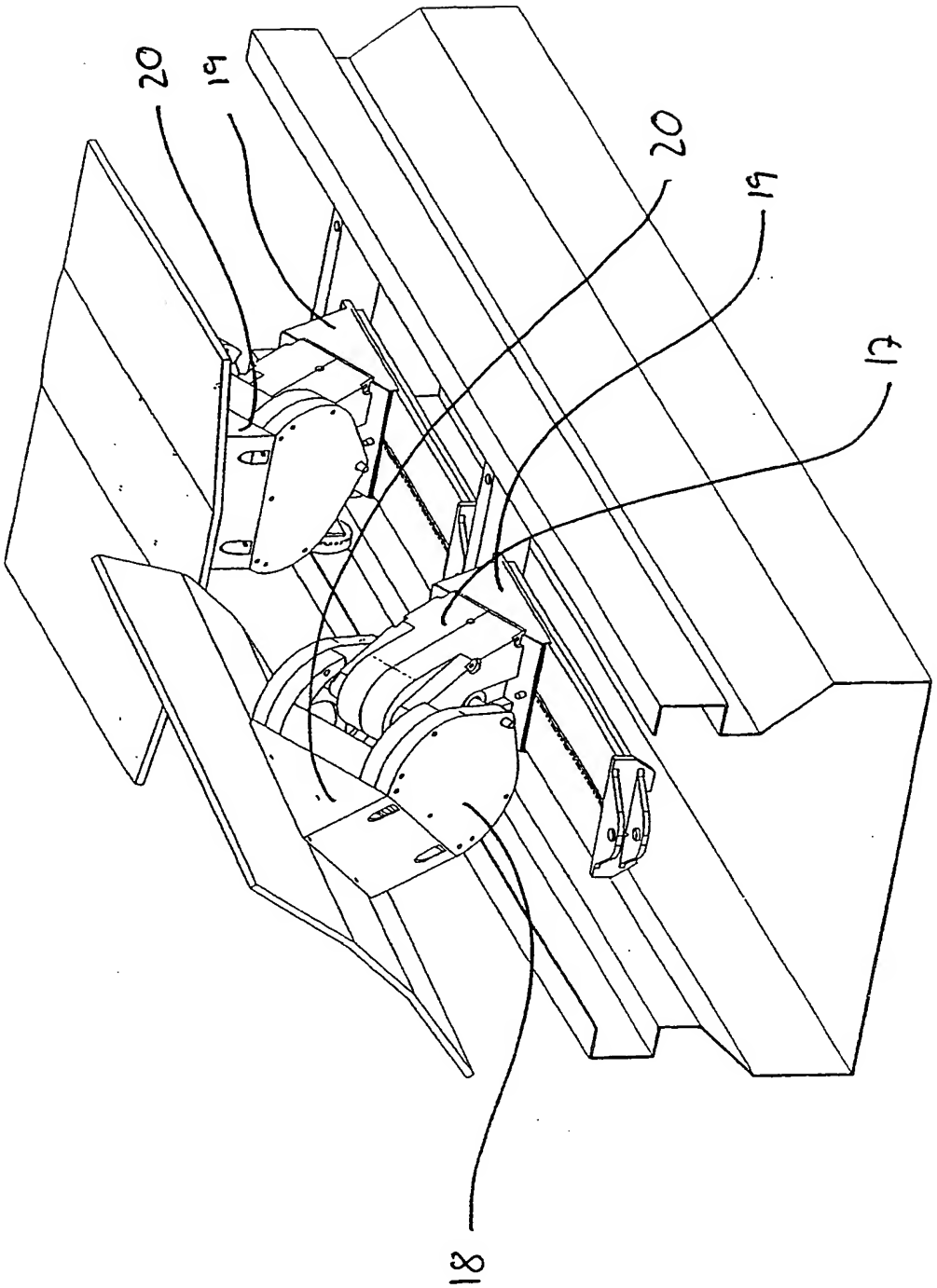

Fig. 9

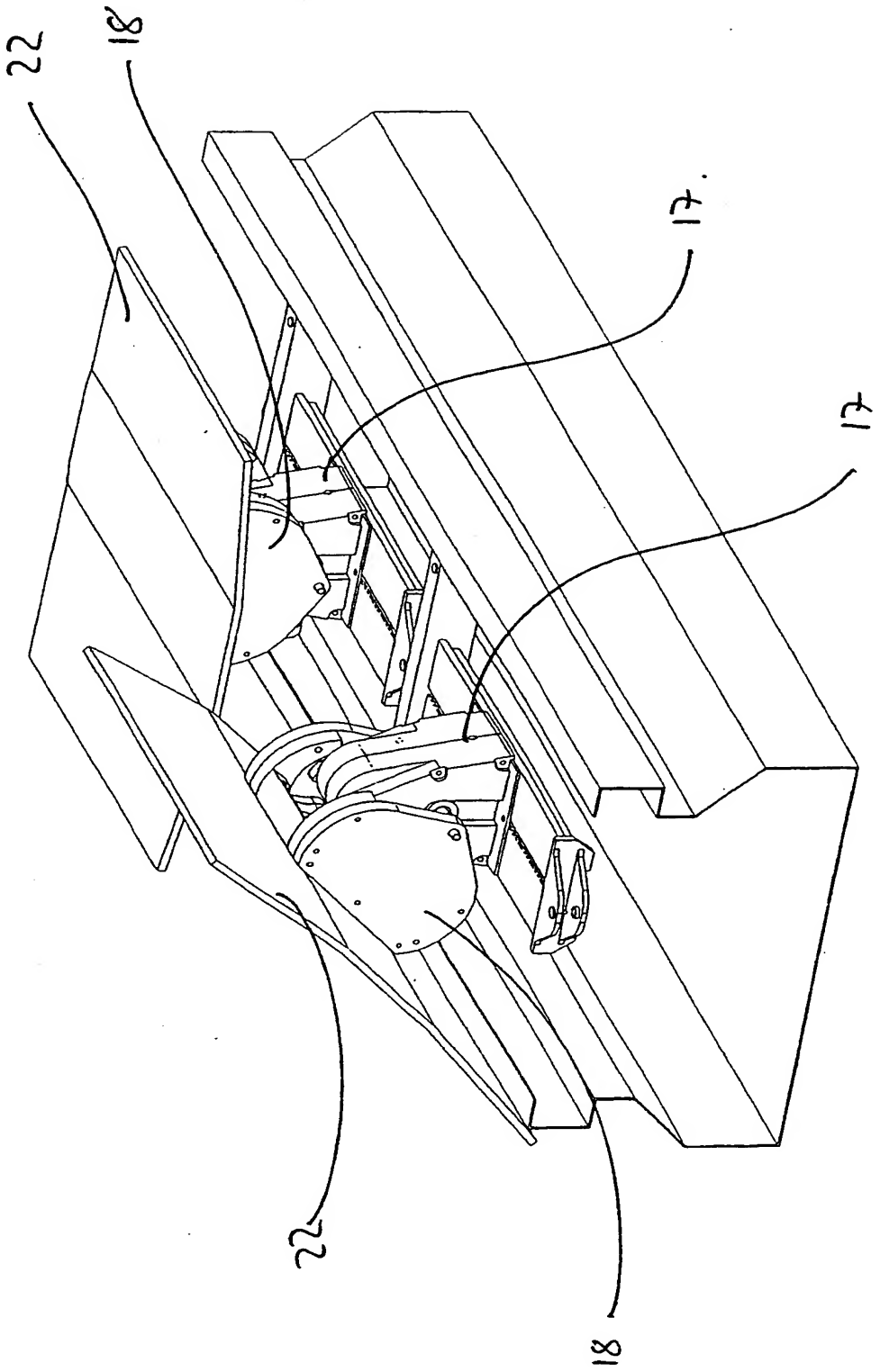

Fig. 11

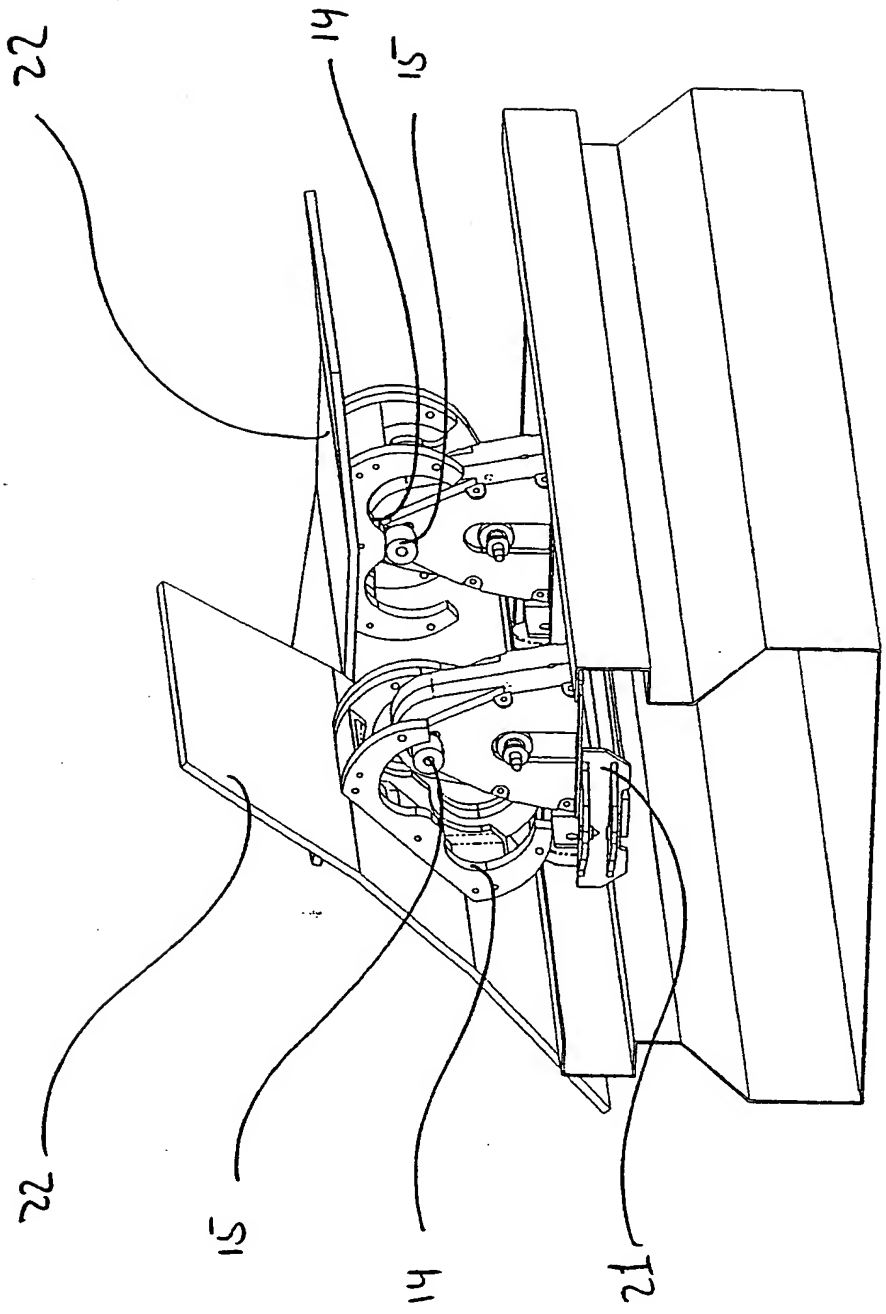

Fig. 13

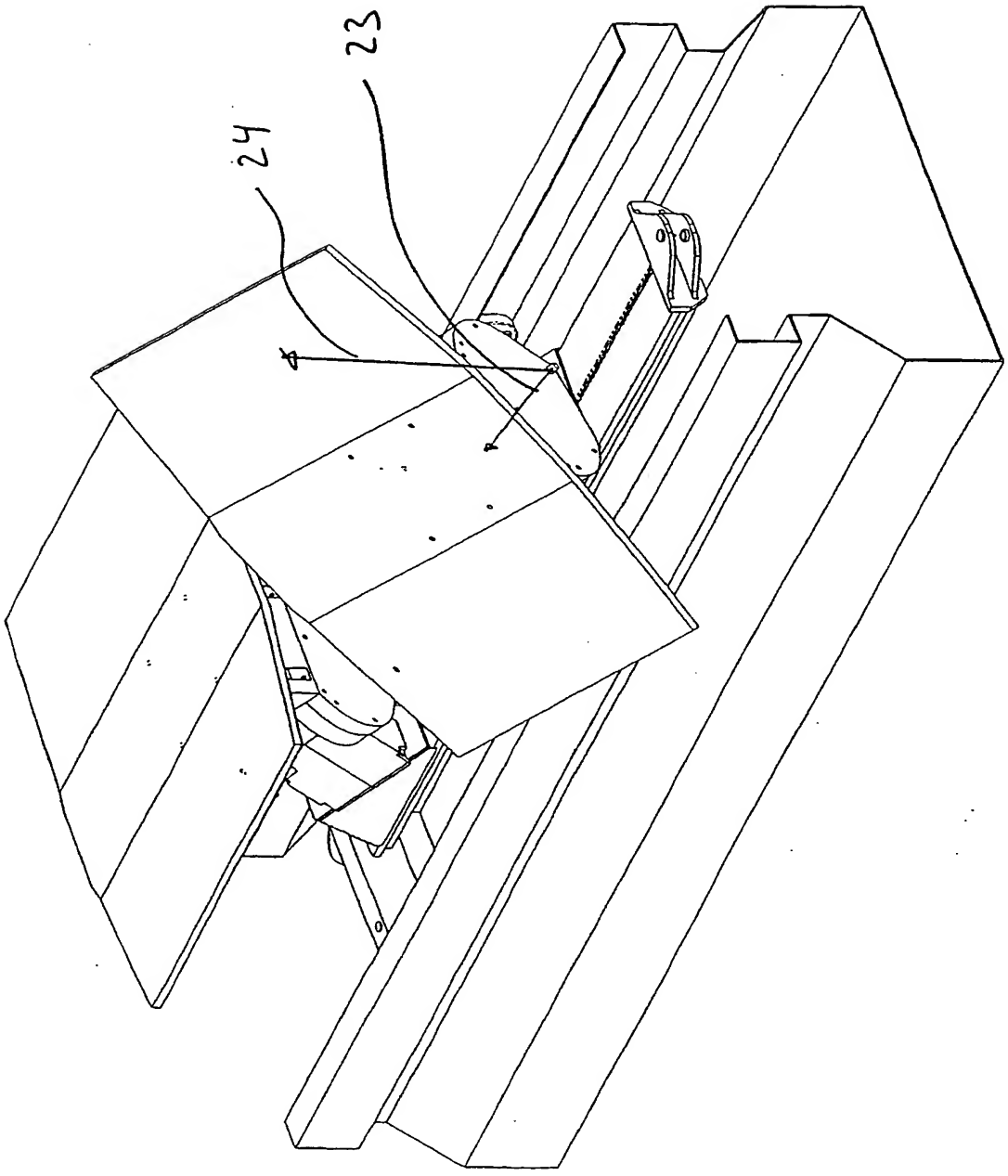

Fig. 15

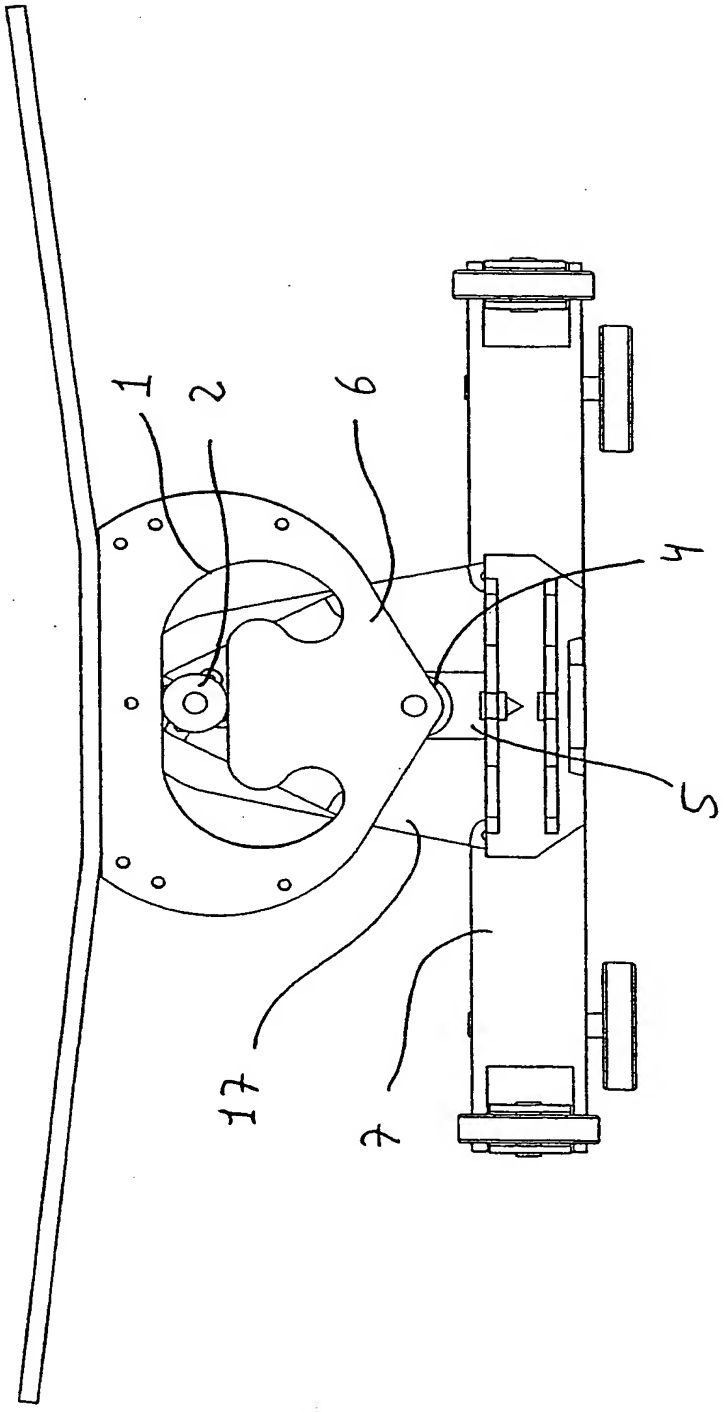

Fig. 17

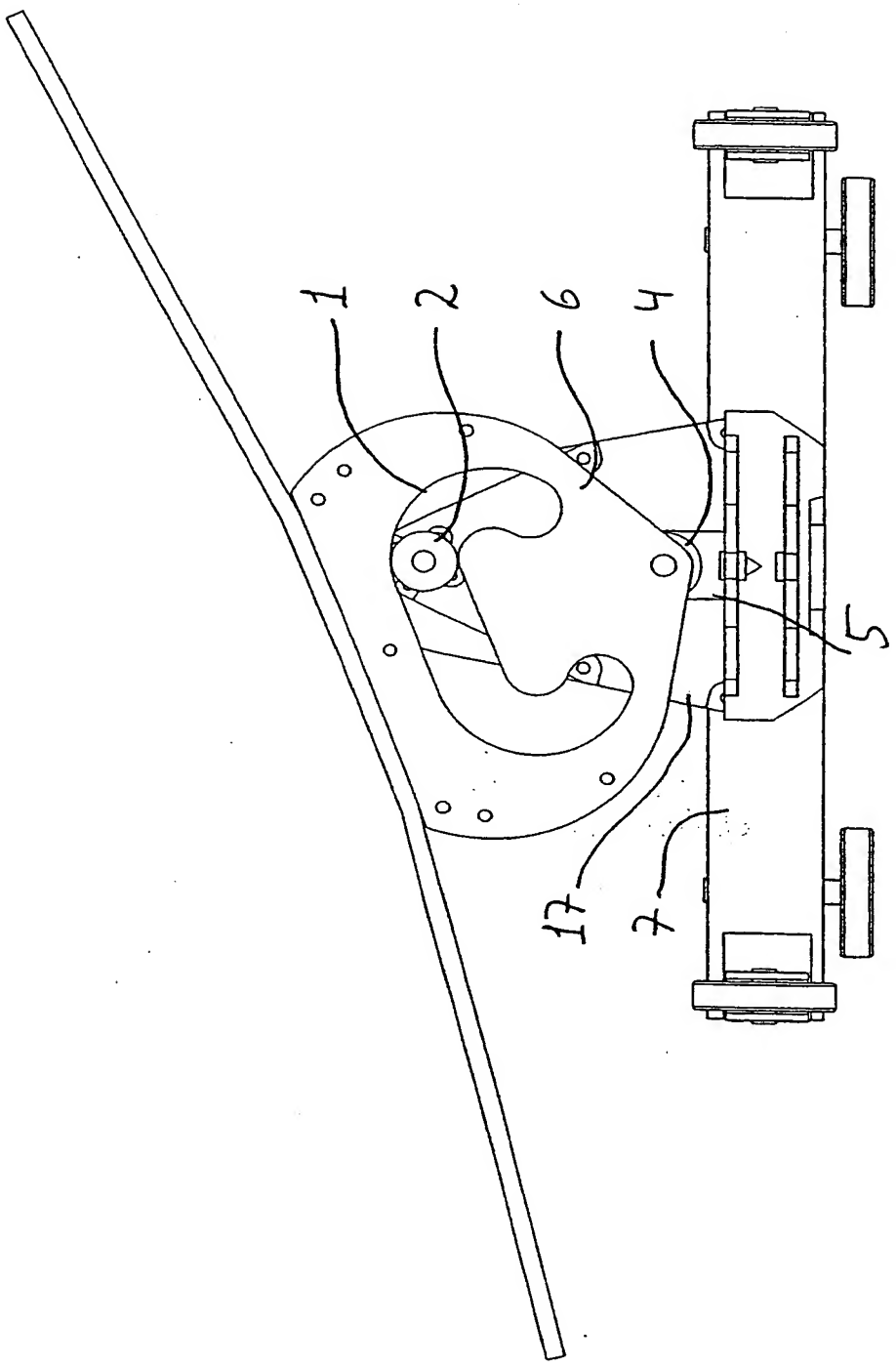

Fig. 19

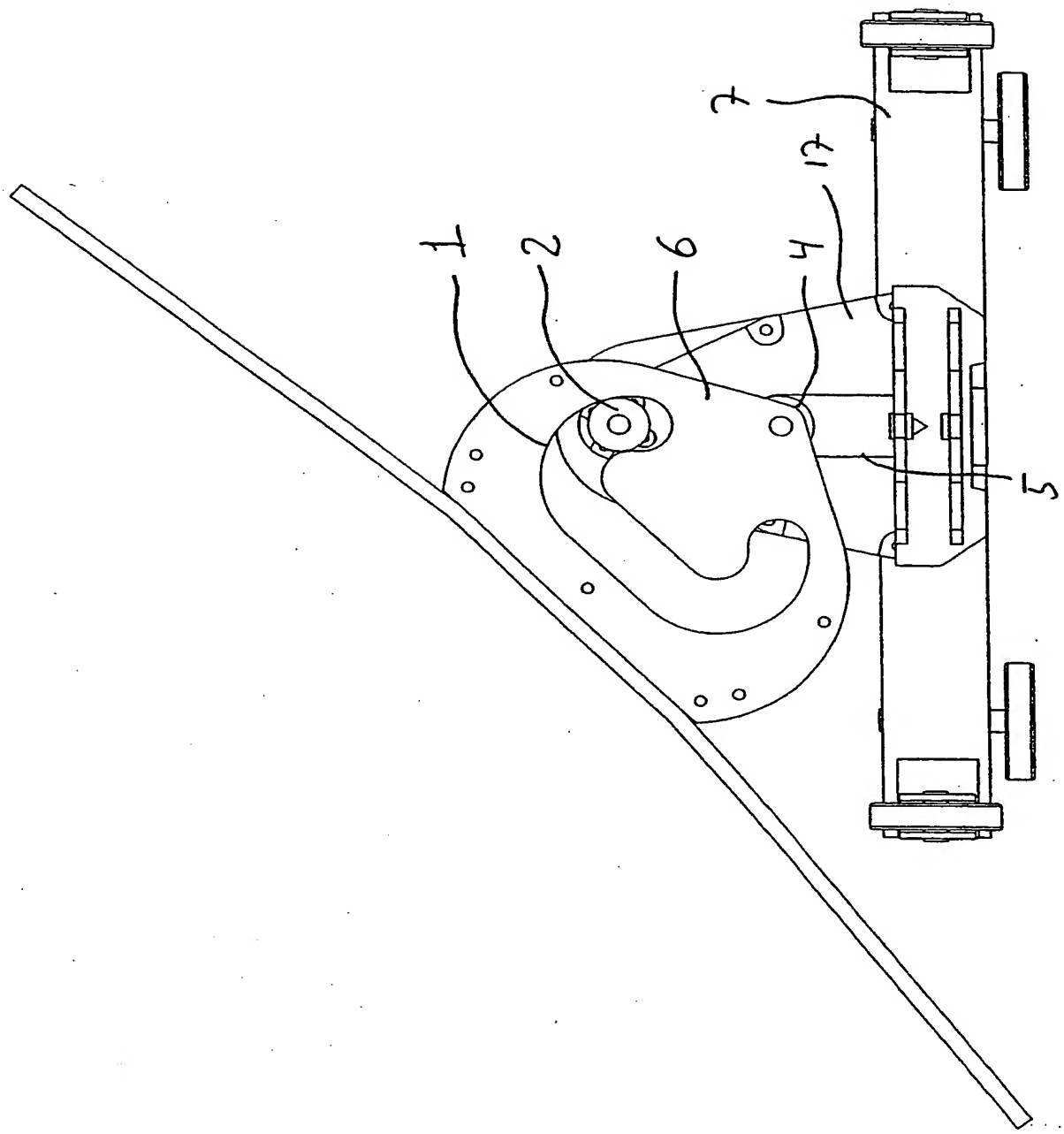

Fig. 21

INTERNATIONAL SEARCH REPORT

Inte. ..ational application No.
PCT/DK 00/00272

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9834859 A1 (SIEMENS AKTIENGESELLSCHAFT), 13 August 1998 (13.08.98), figures 1-6, claims 1-3	1,42,43,69

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